Stagnicola impedita nov. sp. Vol. 47, pl. 14, fig. 3.

Shell much elongated, narrow, of 6–6½ loosely coiled, flat-sided whorls; spire very acute; sutures deeply indented; body whorl flattened, elongated; aperture less than half the length of shell, elongate-ovate; outer lip without marked varical thickening; inner lip narrow, appressed at its junction with parietal wall forming a slight plait; umbilical chink small; surface shining, sculpture of fine growth lines crossed by fine spiral impressed lines; there is a wash of callus on the parietal wall.

Length	Diam.	Aperture length	Width	
16.5	6.1	6.3	3.0 mm.	Holotype.
16.0	6.1	6.2	3.0 mm.	Paratype.
15.7	6.0	7.9	3.2 mm.	"
13.2	5.2	6.0	2.5 mm.	"

Type locality: Near Logan, Cache Co., Utah, Hemphill collection. *Types:* Stanford University, Geological Department, No. 5776.

This small lymnaeid bears the most striking resemblance to *Stagnicola kirtlandiana* (Lea), and was so labelled in the Hemphill collection. It differs from Lea's species in being smaller, the whorls are not as long, not as rounded, sutures less deeply impressed, body whorl wider, aperture more ovate, columellar plait less marked, and sculpture much finer. The two species appear to be almost parallel in development although inhabiting widely separated areas.

THE POLYGYRA TRIDENTATA COMPLEX

BY A. F. ARCHER

Outside of the section *Stenotrema* few groups of *Polygyra* give more trouble in identification than the *Polygyra tridentata* complex. This complex belongs in the section *Triodopsis*. An examination of material that from time to time has come into the collection of the Museum of Comparative Zoology, Cambridge, Massachusetts, shows that there has been uncertainty and confusion in the determination of the species contained in this group. This is due both to the difficulty of naming, and to the uncertain application of names that existed in the latter half

of the last century. Anyone who has such material straight from the field should exercise the utmost care in sorting and studying it before determination. A superficial glance is not always sufficient in recognizing the true differences existing in these forms.

Dr. Pilsbry has rendered great service to the study of these forms by detecting important and consistent differences between the various species and varieties of this group, which had hitherto been overlooked. He classified and named many new forms, and established the true status of several others. A large collection of these forms shows that they are worthy of study from the point of view of geographical distribution, and it is there that the value of differentiating them is most evident.

Many of the species belonging to the complex have a wide range of distribution. They are for the most part fairly small snails, and their shells are usually characterized by tridentate apertures. These armatured apertures serve as protective devices against the attacks of carnivorous beetles, and even against other molluscan enemies such as *Haplotrema concavum* (Say). The form and arrangement of these apertural teeth are some of the most important characters for differentiating the species, and seem to express very clearly their innate differences. These snails are ground livers, and are found among the leaves and humus in open woods and wooded hillsides. In favorable localities they may often be found in great abundance.

Their radulae, using *P. tridentata* as an example, bear rather long central teeth, and the outer marginal teeth are bifid. In the genitalia the penis is rather long with a terminal retractor muscle, and the vas deferens enters near the summit. The spermatheca is small and globular, while its duct is long and rather large at the base. The shell is umbilicate and either globose or depressed. Very few malformed individuals are encountered. The most common malformation is a misshapen peristome.

The purpose of this paper is to deal with the various species in the group, and to attempt to show their geographical distribution. Many of the names of these forms have been scattered through the literature. They will here be brought together, and

defined. The definitions will deal chiefly with their distinguishing characteristics, so that the identification of them may be rendered easier. The species included here are those inhabiting the area extending from the Atlantic coast as far west as the western border of the Mississippi Valley. No related forms occurring outside of those limits are dealt with here. Dr. Pilsbry has very kindly lent paratypes of several forms for examination and figuring.

Section Triodopsis Rafinesque

Group of Polygyra tridentata

1. *Polygyra tridentata* (Say)
2. *Polygyra tridentata juxtidens* Pils.
3. *Polygyra tridentata tennesseensis* W. & P.
4. *Polygyra tridentata complanata* Pils.
5. *Polygyra tridentata edentilabris* Pils.
6. *Polygyra fraudulenta* Pils.
7. *Polygyra fallax* (Say)
8. *Polygyra fallax goniosoma* Pils.
9. *Polygyra vannostrandi* (Bland)
10. *Polygyra vannostrandi alabamensis* Pils.
11. *Polygyra hopetonensis* (Schutt)
12. *Polygyra hopetonensis charlestonensis* Maz.
13. *Polygyra hopetonensis obsoleta* Pils.

The first reference under each species is the original citation. Additional references are given for critical notes and figures. Specific localities cited are for the specimens figured.

1. Polygyra tridentata (Say). Pl. 1. fig. 1, near Wissahickon Creek, Chestnut Hill, Philadelphia.

Helix tridentata Say, Nicholson's Encycl. 4, pl. 2. f. 1 ("inhabits the middle states").

Triodopsis tridentata Say, W. G. Binney, 1885, Man. Amer. Land Shells, p. 291, f. 312.

Polygyra tridentata Say, Pilsbry, 1894, Proc. A.N.S.P., p. 19, pl. 1, f. 7.

The shell is depressed, umbilicated, chestnut to light horn color, and covered with raised axial ribs. The number of whorls varies from $4\frac{3}{4}$–$5\frac{3}{4}$. Besides its flattish shape it may be distinguished by the following characteristics. *The aperture bears three teeth. The marginal tooth is situated on the upper* half

of the peristome. The basal tooth is situated more than halfway toward the outer margin of the peristome. Both teeth are simple and acute. The parietal tooth is oblique and strong.

The figured specimen is chosen because it is typical of Say's species. There is a wide range of variation in the species throughout its geographical range. Numbers of geographical races exist. This species has the widest range of any species in the group. It is found in Vermont, northern New York and Ontario Province, Canada, and extends southward into northern Georgia and Alabama. It is found in eastern Iowa and ranges clear across the country to the Atlantic coast. It is virtually absent in most of New England except the extreme west. In the South it occurs throughout the mountains, but is absent in the coastal region. Throughout the northeastern range of the species the forms are of medium size (about 15 mm. in diameter). They are inclined to be chestnut colored, and the peristome is often pinkish. The distribution in Virginia is limited to the western part of the state, where puzzling forms occur. In Rockbridge County rather large heavy specimens are found while in Roanoke County small, flat, weak toothed forms occur. The forms of North Carolina are also dark colored, but are larger than those of the more northern regions. Slightly smaller but otherwise similar forms occur on the Tennessee slope of the Appalachian Mountains. The species is absent in the western half of Tennessee. It ranges throughout Kentucky, and here we find very depressed light colored shells, some of which measure 20 mm. in diameter, while in several localities heavy specimens exist. The species occurs throughout the Middle West, east of the Mississippi, and is especially common in Indiana, though rare in Michigan. The shells found in this region are medium sized and usually rather dark. The localities in northern Georgia and north Alabama yield specimens similar in appearance to those of the Appalachian Region.

It must be concluded from this that *P. tridentata* is a successful species, capable of existing in a wide area, and under varied conditions. It is most common in open woods, among leaves or rocks. It does not seem partial to any particular type of geological formation, for it is found equally among limestone rock

in some regions, and sandstone or granitic rock in other regions. Few Polygyras, with the notable exception of *P. thyroidus* (Say), are more adaptable to various climates and regions than *tridentata*. It is, however, obvious that it has not survived this great variety of conditions without variation taking place.

2. Polygyra tridentata juxtidens Pilsbry, 1894, Proc. A.N.S.P., p. 20, pl. 1, fig. 8. (Cave Town, Md.).

The shell is quite exactly like *P. tridentata* in external appearance. It is readily distinguished in tooth structure. *It differs from tridentata in having the marginal tooth situated at least halfway down the peristome towards the base, near the basal tooth. The parietal tooth slants toward it or just above it, while in tridentata it slants below it.*

The geographical range of *P. tridentata juxtidens* is somewhat more extensive than that of *P. tridentata*. It occurs in Northern and Western New England and extends southwestward to Eastern Iowa and Eastern Missouri. It is absent in Ontario Prov., Canada, Michigan and the northern half of the middle states. It has not been reported from the western slope of the Appalachian Mountains except in Nicholas County, Kentucky. It is almost absent in the mountain region of North Carolina where *tridentata* is common. However, the region lying east of this it is present to the exclusion of *tridentata*. It likewise supersedes the straight species in the New Jersey area, but is less common in Maryland. Just south of the Potomac River it again outbalances *tridentata*. The small or medium sized dark form is characteristic of the northeastern area of Virginia. The typical forms occur in northern Virginia and northern West Virginia, one of which is figured. Large heavy specimens occur in Rockbridge County and Roanoke County, Virginia. Fairly typical forms are found in central North Carolina and South Carolina. Unusually broad lipped specimens have been taken at Eutaw Springs, Berkeley, Co., South Carolina. Examples from Northern Alabama are frequently large and flat. Fairly typical specimens have been collected in eastern Iowa and eastern Missouri.

An interesting geographical race occurs in the southern half of the middle western states especially Indiana and Ohio. This

race is characterized by being horn colored, broad, and more compressed than the typical form. The shell is quite shiny, and the striae are less pronounced than in the typical. Pilsbry named this form *Polygyra tridentata discoidea* (Pilsbry 1904, Nautilus *17,* p. 142). It seems inadvisable to consider this apart from *juxtidens,* of which it seems to be a geographical race. It exactly corresponds in tooth structure, general character of the sculpture, etc. One set from Cincinnati, Ohio, has the tooth structure of *P. tridentata,* but otherwise is like the race mentioned above. This must be considered as *tridentata* despite that fact. The same form of *tridentata* also occurs independently in Central Kentucky.

3. Polygyra tridentata tennesseensis Walk. & Pils. Plate 1, fig. 3, Concord, Anderson Co., Tenn. Diam. 19.5 mm.

Polygyra tridentata tennesseensis Walker & Pilsbry, 1902, Proc. A.N.S. Phila,, p. 422. (South side French Broad R., below Paint Rock, Tenn.) Walker, Terrestrial Shell-bearing Moll. of Ala., Univ. Mich. Mus. Zool. Misc. Publ. No. 18, p. 22.

The shell is large (diameter 22–24 mm.) rather flat and is similar to *P. tridentata* in coloring and sculpture. *It is different in being consistently larger, while the marginal and basal teeth though typically situated are smaller. The parietal tooth is sharper and more prominent.*

This variety is peculiar to the Eastern Tennessee and the Northern Alabama region where it replaces *P. tridentata.* It is not very variable in size and color, but on the northern and eastern periphery of its range forms have been found which are intermediate between it and *P. tridentata.* In the center of its range the forms are quite distinct from any other related forms.

4. Polygyra tridentata complanata Pils. Pl. 1, fig. 4. Burnside, Pulaski Co., Ky. Diam. 21 mm.

Polygyra tridentata complanata Pilsbry, 1898, Nautilus, 12, p. 22. (Burnside, Ky.)

The shell in appearance quite suggests the forms of *P. tridentata juxtidens* from southern Ohio and southern Indiana. Like them the shell is large (diam. 21–23 mm.) and shiny. *It differs in being flatter and more openly umbilicate. The marginal and*

basal teeth are almost absent, mere slight traces appearing in the same positions as those of typical P. tridentata. The parietal tooth is smaller and sharper.

This form has only been found in south-central Kentucky. Exceptionally small specimens (diam. 17 mm.) have been found in Casey County, but aside from their size they are quite typical.

5. Polygyra tridentata edentilabris Pils. Pl. 1, fig. 5. Cumberland Mts., Tenn. Paratype. Diam. 12 mm.

Polygyra tridentata edentilabris Pilbry 1894, Nautilus, 7, p. 140. (Cumberland Mts., Tennessee.)

The shell resembles that of *P. tridentata.* It is small (diam. 12 mm.) and is shaped exactly like small specimens of *tridentata. It differs in the entire absence of the marginal and basal teeth.* It is yellow horn colored, with a whitish peristome.

This apparently rare form comes from the Cumberland Mountains, Cumberland plateau region, central Tennessee. It is a remarkable form, contrasting with *P. tridentata tennesseensis* of the surrounding country. This species contrasts also with *P. tridentata complanata* in its small size and rugose appearance. Both forms are virtually toothless, but this does not necessarily indicate a close relationship. The figured specimen is a paratype sent by Dr. Pilsbry for examination.

(To be continued)

NOTES ON THE LIFE HISTORY OF PLEUROCERA CANALICULATUM UNDULATUM SAY

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For the past two years the writer has been making some anatomical studies on the fresh-water gastropod, *Pleurocera canaliculatum undulatum* Say, during which time numerous collections have been made from one vicinity. All the animals studied have been taken from the Licking River at or near the town of Butler, Kentucky. Although no regular population samples have been taken for life history work certain facts have